

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 26 APR 2006

PCT

Applicant's or agent's file reference 305606WO/CMH	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/GB2005/000948	International filing date (day/month/year) 11.03.2005	Priority date (day/month/year) 17.03.2004	
International Patent Classification (IPC) or national classification and IPC INV. B01J31/18 B01J31/22 B01J31/34 C07C2/30			
Applicant SASOL TECHNOLOGY (UK) LIMITED et al.			
1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of 8 sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. <input type="checkbox"/> sent to the applicant and to the International Bureau) a total of sheets, as follows: <input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box. b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).			
4. This report contains indications relating to the following items: <div style="margin-left: 20px;"> <input checked="" type="checkbox"/> Box No. I Basis of the report <input type="checkbox"/> Box No. II Priority <input checked="" type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV Lack of unity of invention <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI Certain documents cited <input type="checkbox"/> Box No. VII Certain defects in the international application <input type="checkbox"/> Box No. VIII Certain observations on the international application </div>			
Date of submission of the demand 30.01.2006		Date of completion of this report 25.04.2006	
Name and mailing address of the international preliminary examining authority: <div style="display: flex; align-items: center;"> <div> European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 </div> </div>		Authorized officer Goebel, M Telephone No. +49 89 2399-	



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Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
 - ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-22 as originally filed

Claims, Numbers

1-26 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
 - ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):
 4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
 - ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

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Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:
- ☐ the entire international application,
 - ☒ claims Nos. 25
- because:
- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):
 - ☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):
 - ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
 - ☒ no international search report has been established for the said claims Nos. 25
 - ☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:
 - the written form ☐ has not been furnished
 - ☐ does not comply with the standard
 - the computer readable form ☐ has not been furnished
 - ☐ does not comply with the standard
 - ☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.
 - ☒ See separate sheet for further details

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	
	No: Claims	1-24, 26
Inventive step (IS)	Yes: Claims	
	No: Claims	1-24, 26
Industrial applicability (IA)	Yes: Claims	1-24, 26
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Non-establishment of Opinion:

1. The initial phase of the search revealed a very large number of documents relevant to the issue of novelty. So many documents were retrieved that it is impossible to determine which parts of the claim **25** may be said to define subject-matter for which protection might legitimately be sought (Article 6 PCT). Quite plainly, **any C4+ olefin** appears encompassed in "omnibus" claim **25**, since (i) **no particular starting olefins** are defined in referenced independent claim 20 and (ii) **by products are also "products"** in the absence of further specification. C4+ Olefins, however, are **well known**. For these reasons, **no search** was performed for claim 25.
2. Subject of this written opinion is exclusively subject-matter covered by the international search report and thus searched (see Box I.2 in Form PCT/ISA/210), in accordance with Rules 43*bis*.1(b) and 66.1(e) PCT. Therefore claim **25** is **not subject of this written opinion and will not be subject of any international preliminary examination**.

Documents Cited:

Reference is made to the following documents (**D1-D17**), cited in the international search report ("ISR"):

- D1:** US-A-3 903 193 (MALY ET AL) 2 September 1975 (1975-09-02)
D2: US-A-3 813 453 (WIDEMAN L,US) 28 May 1974 (1974-05-28)
D3: US-A-5 059 739 (HENDRIKSEN ET AL) 22 October 1991 (1991-10-22)
D4: US-A-5 466 648 (WINSLOW ET AL) 14 November 1995 (1995-11-14)
D5: US-A-3 784 629 (MALY N,US ET AL) 8 January 1974 (1974-01-08)
D6: US-A-3 784 630 (MALY N,US ET AL) 8 January 1974 (1974-01-08)
D7: US-A-3 784 631 (MENAPACE H,US ET AL) 8 January 1974 (1974-01-08)
D8: US-A-3 897 512 (BROWN ET AL) 29 July 1975 (1975-07-29)
D9: OLIVIER H ET AL: "Homogeneous and two-phase dimerization of olefins catalyzed by tungsten complexes. The role of imido ligands and Lewis acids" JOURNAL OF MOLECULAR CATALYSIS A: CHEMICAL, vol. 148, no. 1-2, 1 December 1999 (1999-12-01), pages 43-48, XP002351888
D10: MENAPACE H R ET AL: "Changing the Reaction Paths of a Metathesis Catalyst" JOURNAL OF ORGANIC CHEMISTRY, vol. 40, no. 20, 1975, pages

2983-2985, XP002351889

- D11:** US-A-4 469 809 (KLOSIEWICZ ET AL) 4 September 1984 (1984-09-04)
D12: LEFEBVRE F ET AL: "ARYLOXY COMPLEXES AND CYCLOMETALLATED ARYLOXY ALKYLIDENE COMPLEXES OF TUNGSTEN (VI). APPLICATION TO THE METATHESIS OF FUNCTIONALIZED OLEFINS?" POLYHEDRON, vol. 14, no. 22, October 1995 (1995-10), pages 3209-3226, XP002351890
D13: EP-A-0 526 101 (NESTE OY) 3 February 1993 (1993-02-03)
D14: EP-A-0 456 373 (NESTE OY) 13 November 1991 (1991-11-13)
D15: US-A-4 016 220 (KUPPER ET AL) 5 April 1977 (1977-04-05)
D16: US-A-4 010 113 (OFSTEAD ET AL) 1 March 1977 (1977-03-01)
D17: US-A-4 727 215 (SCHROCK ET AL) 23 February 1988 (1988-02-23)

Documents **D1-D3** and **D5-D10** are also mentioned in the application. Unless indicated otherwise, the **respective passages** cited with the individual documents in the ISR **apply** in assessing these documents in the individual sections below.

Novelty:

1. The terms "free of ... acid" and "base" are interpreted according to the present description and commonly accepted terminology. In particular, **organoaluminum halides** are known to be **Brønsted bases** (as well as Lewis acids). **More than one ligand precursor is encompassed** by the present independent claims, by virtue of the open claim language, in particular in claim 1 ("catalyst system **including** ...").
2. The subject-matter of present independent claims **1, 16** and **19** appears to be **known** from documents **D1-D16**, which all disclose such (methods for making) catalyst systems. In particular, **D1-D10** rely on **N-ligands (anilines, pref. substituted)**, whereas **D11-D16** rely on **O-ligands** (phenols, alcohols, diols, acetylacetonates, carboxylic acid half esters, cf. present description, page 7). **D5** and **D7** comprise additionally a **bidentate O-O ligand**. **HCl** is generally **removed** by the added **organoaluminum halide base** in **D1-D11, D15** and **D16**; **D3, D11** and **D16** foreseeing a further explicit removal step by **passing an inert gas through the reaction mixture**; **D4** foreseeing a further explicit removal step by **evaporating the reaction mixture** (this being taught as equivalent in **D16**). In **D12** the W-ligand complexes are **purified**, which will

likewise remove HCl, in **D13-D14** the reaction solutions are first stirred and optionally heated to drive off HCl, then **evaporated**. Stirring at **elevated temperature** (132°C) is also performed in **D1** and **D2**, apparently to drive off HCl (cf. **D13, D14**) and taught as advantageous.

3. The subject-matter of present independent claims **20** and **26** appears to be likewise **known** from documents **D1-D10**, which all disclose the use of the respective disclosed catalyst systems in **olefin (co)dimerisation**.
4. The subject-matter of the dependent claims **2-15, 17-18** and **21-24** is likewise **known** from **D1-D16** as set out in the ISR (cf. all claims with "X" categories)
5. Therefore, the present application does not meet the criterion set forth in Article 33(2) PCT, as the subject-matter of **all** examined claims **1-24** and **26** appears to be **not novel** (cf. Rules 43*bis*.1(b) and 64(1)-(3) PCT).

Inventive Step:

1. Notwithstanding the objection of lack of novelty against all claims, the following further observations are made regarding inventive step, should the applicant in a later stage be able to delimit the subject-matter vs. the prior art.
2. Starting from **D1** or **D2**, it appears **obvious** in view of **D3** to more effectively remove HCl while maintaining the **molar ratio of aniline N-ligand vs. W** at approximately 2 (i.e. 1:4/n, since n= 2) corresponding to the preferred ratios in claims **2-4**. The advantage of less **organoaluminum halide** consumption is clearly taught in **D3** (i.e. these act as base).
3. **D17** discloses the preparation of similar W-aniline complexes as in claim **1**, only **differing** by the **molar ratio W:N being equimolar**. However, a further **purification step** using **triethyl amine** (cf. all present worked examples), beside evaporation of the reaction mixture, is disclosed as leading to analytically pure material. Hence using such a purification procedure would be considered as (at least!) a **known technical equivalent** for the same purpose and hence **obvious in the absence of unexpected effects**.

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